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Research Article

CLOSED UNIVERSE AND OPEN UNIVERSE TRANSFORMATION

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Abstract

Hawking emphasizes that the universe originated from a big bang, a one-time event that allowed it to grow. According to Hopkins's theory, the universe was formed through extreme compression, where all matter, materials, and space were folded into a tiny state. During this compression, it suddenly exploded at a critical moment, creating the universe. Einstein viewed space and time as interconnected, forming space-time, where time needs space to grow and space needs time to expand. This relationship is central to Einstein's field theory. While these ideas explain the universe's beginning and expansion, they rarely address the existence of multiverses or other universes. In this paper, we explore a new concept for universe formation, considering both closed and open models, using Hamilton's topological hypothesis to develop a new assumption about the origins of space and time beyond conventional ideas.

Keywords: Closed Universe, Open Universe, Closed Universe & Open Universe Transformation, Space-Time, Beyond the origin.

INTRODUCTION

In Planck-scale physics, the early universe is modeled as a blackbody with a Planck temperature. During cosmic inflation, horizon entropy increases, but as the universe cools and expands, temperature decreases inversely with scale factor. Some models suggest that at very low temperatures, gravitational effects may cause contraction due to insufficient thermal pressure to counteract gravity. This negative feedback can slow or reverse expansion, with the Hubble parameter evolving accordingly. Over time, the expansion rate may diminish, with temperature approaching zero asymptotically. As temperature drops, entropy production lessens, possibly halting further increase. According to the generalized second law of thermodynamics, when total entropy stops increasing, cosmic time flow would cease, leading spacetime to become quasi-static where both time and space are frozen. Ultimately, the universe might collapse into a 'Big Crunch' when entropy and energy cannot sustain expansion, resulting in a singularity. This article explores the potential for a cosmological contraction driven by gravitational forces, which may produce a closed universe and an open universe, accordingly.

In this process, all matter and energy could be compressed into a single, infinitely dense point known as a gravitational singularity. This idea is consistent with certain cyclic universe models, which suggest that such contraction might be followed by a rebound or phase transition, leading to subsequent expansion—often called a 'Big Bang' or bouncing cosmology. The universe can be viewed as an open system within theoretical physics, where observing or extracting a segment effectively extends or expands its complementary region. This leads us to hypothesize the existence of a dual cosmological domain that contracts while our observable universe expands. Similar to imagining two symmetrical cylindrical structures in a duality framework, the topology of a conical manifold may represent a separate but related sector of the universe.

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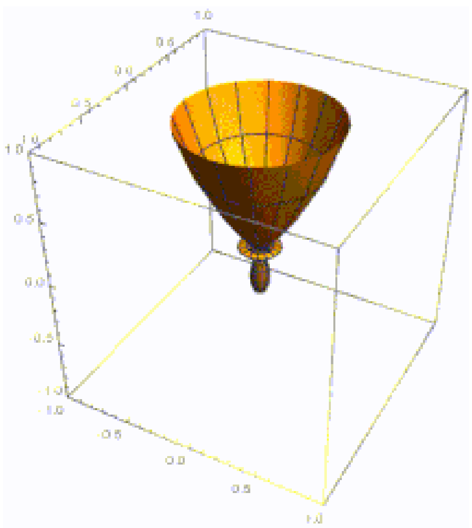
This duality, Multiversal landscape, suggests two interconnected regions with mirror-like gravitational and metric properties: one region exhibits metric expansion aligned with Friedmann-Lemaître-Robertson-Walker (FLRW) solutions, while the other contracts. This concept is our innovative suggestion of the broader open and closed cosmological framework, hinting at a multiverse where boundary conditions at asymptotic limits influence each sector's evolution. Which is aligned with the (FLRW) model. This research paper provides a reasoned discussion on the theoretical basis of the proposed cosmological model, rooted in the fundamental energy conservation principle an inviolable law in both classical and modern physics.

Our innovative model explores both closed and open universe configurations, ensuring energy conservation within each. The 'expand–contract' cosmological framework aligns with classical and quantum interpretations, including Friedmann-Lemaître-Robertson-Walker (FLRW) solutions with various curvature parameters. Additionally, these models' implications for entropy relate to the thermodynamic arrow of time, consistent with the second law, which states entropy increases in isolated systems. The conservation law is represented through binary states 0 (no energy exchange or static) and 1 (active transfer or dynamic) highlighting the quantized nature of physical states. This approach integrates thermodynamics, quantum information, and relativistic cosmology, providing a comprehensive view of the universe's energy evolution. Furthermore, employing the harmonic oscillator lattice phonon model as a conceptual framework supports measurement mechanisms and validates its use as an analytical tool in condensed matter physics and quantum information science. Our framework utilizes the quantization of lattice vibrational modes, known as phonons, as fundamental bosonic quasi-particles. This approach enables a detailed understanding of phonon-mediated interactions, decoherence mechanisms, and energy transfer processes. By modeling lattice vibrations with these quantized vibrational eigenmodes, we improve the precision, reproducibility, and coherence of measurement protocols. This provides a solid microscopic basis for interpreting complex quantum phenomena and designing more stable, high-fidelity quantum measurement schemes. The harmonic oscillator concept can be extended to a one-dimensional crystalline lattice made up of many identical particles, usually atoms or ions arranged periodically. Imagine a one-dimensional quantum harmonic chain with N identical atoms connected by elastic forces. This model provides a basic quantum mechanical framework for analyzing lattice dynamics, offering a simplified yet meaningful view of more complex solid-state systems. In this context, quasiparticles called phonons appear as quantized collective vibrational excitations of the lattice. The formalism developed for this one-dimensional system can be readily expanded to higher dimensions, like two- or three-dimensional crystal lattices, enabling the study of a wide range of vibrational phenomena in condensed matter physics.

Duality UniversesTransformation Framework Suggestion:

The positions of masses in the lattice are denoted by x_1, x_2,… measured relative to their equilibrium points, where $x_i = 0$ indicates the i_{th} particle is at equilibrium. In systems with multiple dimensions, these position vectors are treated as multi-component vectors. The Hamiltonian for this system can be expressed using the atomic mass m, along with the position operators x_i and the conjugate momentum operators p_i for each atom. The sum includes interactions between nearest neighbors, indexed by j, summed over adjacent lattice pairs. Here, m is the uniform atomic mass, and $V(x_i - x_j)$ denotes the potential energy from displacements between neighboring atoms. To facilitate analysisparticularly for systems with periodic boundariesit is common to convert the Hamiltonian into reciprocal (Fourier) space. This involves representing the displacement and momentum operators through normal mode coordinates characterized by wave-vector q, which decouples the equations of motion for collective vibrations (phonons). This transformation provides an effective and elegant framework for studying lattice dynamics and the vibrational spectra of crystalline solids.

Expansion and contraction of each side of the universes (Closed-Open of Universes)

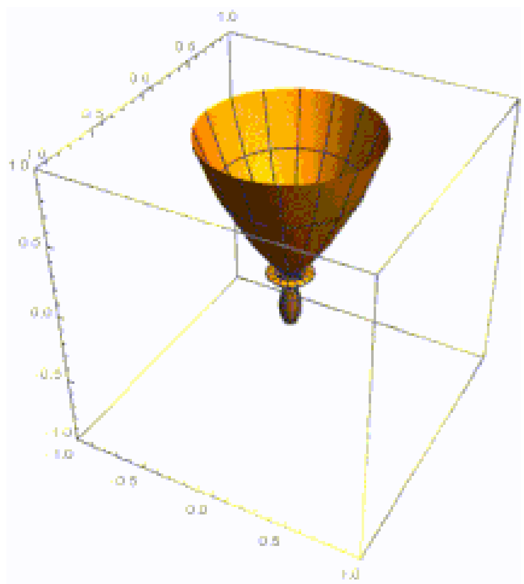


Cc: Oscillating dipoles. Wiki

Figure 1.

The excerpt explains the superposition principle applied to three oscillating dipoles, focusing on the evolution of the wave function with quantum numbers (n, l, m). It introduces N normal-mode coordinates, Q_k, as Fourier transforms of displacement vectors (x_s), for analyzing vibrational modes. N conjugate momenta, Π, are also Fourier transforms of momentum operators (p_s). 'm' is the atomic mass; x_i and p_i are position and momentum operators for the ith atom. Interaction terms are limited to nearest neighbors (nn). The Hamiltonian is reformulated using normal mode wave vectors instead of particle coordinates, utilizing Fourier space to analyze excitations and phonon dispersion. The phonon wave vector, k_n, is 2π divided by wavelength, with discrete values due to finite lattice size, respecting commutation relations. Boundary conditions cause quantization of phonon modes. Coupling terms are eliminated to simplify the Hamiltonian, with operators Q and Π being non-Hermitian. If Hermitian, the Hamiltonian would describe N independent oscillators, each for a vibrational mode, simplifying quantum and energy analysis.

The choice of quantization mode largely depends on the system's boundary conditions. For simplicity and clarity, periodic boundary conditions are usually assumed. This treats the atomic chain as topologically equivalent to a closed loop, where the $(N + 1)_{th}$ atom is identified with the first, forming a seamless, cyclic lattice. Such boundary conditions impose discrete translational symmetry and define the quantization rules for the wave vectors. The highest quantum number, n, is limited by the shortest permissible wavelength mode, which is twice the lattice constant, a, in accordance with the Nyquist sampling theorem. The quantized wave vectors, k, represent eigenmodes of vibrational excitations, with their corresponding energy levels modeled as eigenvalues of a quantum harmonic oscillator Hamiltonian. Zero-point energy contributions result in equally spaced energy levels, separated by the vibrational frequency ω_k, illustrating the harmonic behavior of lattice vibrations within the phonon framework.



Cc: harmonic oscillator.Wiki

Figure 2.

Our model discussion explores multiverse theories, complementary closed and open models with an analogy to proton dynamics. We examines the superposition principle with three oscillating dipoles, illustrating the evolution of a shared wave function across quantum numbers n_2, l_2, and m_2. A set of N 'normal modes' or "normal coordinates' called transformant Q_k are defined as discrete Fourier transforms of spatial 'x_s' variables. N conjugate momenta Π, relating to Fourier transforms of 'p_s', are introduced as well. A visualization shows how the joint wave function evolves for three atomic systems, highlighting how angular momentum quantum numbers affect probability distributions. This effect results from transformations mapped onto different multiverse regions, emphasizing the link between angular momentum and wave function behavior in a multiversal context. The parameter "k_n" is the proton's wave number, defined as 2π divided by wavelength, arising from the finite number of atomic constituents to preserve canonical commutation relations in real and reciprocal space. Using basic quantum principles and trigonometric identities, it's shown that potential energy aligns with the Hamiltonian operator in scattering state space. In the momentum basis, the Hamiltonian forms a quadratic expression involving effective mass and the wave vector squared, implying that quantization and perturbations turn energy into a sum over eigenstates of Qb_i, representing steady quantum information flow.

This paradigm change is used in the current study on the Hamiltonian formulation of a one-dimensional lattice system. The Hamiltonian, originally written as H = (1p^p/2M) Σ Q_i, similar to the kinetic energy, has been transformed via Fourier transformation and rewritten as 2H = (1ħ^2/M) Σ Q_i, with the coupling between position variables explicitly removed, effectively decoupling the degrees of freedom. The operators Q_s and Π_s are assumed to be Hermitian for illustration purposes.

The chosen quantization scheme depends on the boundary conditions used. In this case, periodic boundary conditions are applied, which identify the nth atom with the $(N+1)_{th}$ atom, forming a circular chain. Physically, this means connecting the ends of the linear chain, resulting in a topologically system.

Within this transformation framework, the wavevector k becomes quantized, approaching the integer I as N tends to infinity, defining allowed momentum eigenstates in reciprocal space. Boundary conditions are incorporated into the quantization, ensuring consistent phonon modes. P is the momentum operator conjugate to position, crucial for quantum dynamics. The wavevector K can be rewritten as: (K = K_n = frac{2t pi n}{a}), with n as an integer mode index and a as the lattice spacing. The maximum n is limited by the wavelength, 2a, following the Nyquist criterion. For quantum harmonic oscillators, the energy spectrum for mode (bf{k}) is quantized as: (E_{n_i}Tr = Tr{i_n}_E), where (n_i) is a non-negative integer indicating the excitation level, with energy being conserved. (In the long run).

In order totransformation, the formation should includes the zero-point energy contribution, represented by (frac{1}{2}=ħω_@_mk constant), along with the quantized excitation energies associated with different phonon occupation levels. The zero-point energy can create a point of field; in this paper, we call it a zero-point field. This field can be transformed by the harmonic oscillator's energy spectrum format, which,consists of evenly spaced, discrete levels. The energy gap between neighboring levels is ħω, indicating the smallest vibrational energy quantum needed to move from one state to another. This quantization is similar to the photon case in quantum electrodynamics, where the electromagnetic field, when quantized, introduces the photon as the basic quantum of electromagnetic radiation. In the context of lattice vibrations, this quantum of vibrational energy is called a phonon, a quasiparticle that represents quantized vibrational modes within the lattice.

All quantum systems display both wave-like and particle-like behaviors due to quantum mechanics. To clarify phonon particle-like properties, using second quantization with creation and annihilation operators is helpful. As the lattice spacing "a" approaches zero and the number of sites 'N' becomes very large while keeping 'Na' finite, the coordinate modes Q_k become independent momentum modes of a quantized scalar field, φ(x). Here, the site index 'i' turns into the continuous variable "x', enabling a field-theoretic description. Fourier analysis diagonalizes the Hamiltonian, decoupling modes and simplifying phonon analysis within continuum field theory.

The vibrational modes of a diatomic molecule exemplify a two-body quantum harmonic oscillator. In this system, the angular frequency () depends on the reduced mass (m) and the individual atomic masses (1 and 2). Hooke's atom offers a simplified, idealized model of a helium atom, using quantum harmonic oscillator principles for easier analysis. This helps explain phonons, the quanta of lattice vibrations, as discussed in condensed matter physics. Similar to this, viewing the universe as a bipartite system with two entities within a single framework aids in understanding. Additionally, the behavior of a charged particle with mass m in a uniform magnetic field (b) forms a one-dimensional quantum harmonic oscillator, exhibiting Landau quantization. This results in discrete energy levels from the cyclotron motion of charged particles in magnetic fields. Consequently, the distinction between closed and open,dual universes setups will be clearer with the enhanced support mechanisms described, which bolster both operational reliability and analytical clarity.

Innovative Model Equation: (Transformation in Dual Universes Model)

$$\int \frac{\partial \Omega}{\partial t} exp\big(iS(\Omega)\big)$$

$$\ominus = \int D\Omega exp_{Lie}\big(iS(\Omega)\big)$$

$$\Omega = \int D \ominus exp_{Lie}\big(iS(\ominus)\big)$$

exp_{Lie}refer to the L.i exponential transformation
Ω refer to universe
⊖ refer to event origin (special point)
i refer to an imaginative number

Conclusion

This research paper aims to introduce an innovative conceptual transformation framework for understanding the universe's origin by examining the theoretical models of closedand open dual universes. By applying Hamilton's topology hypothesis, we formulated new assumptions and mathematical structures that shed light on the cosmos's beginnings. We also explore how these models impact our understanding of pre-creation conditions, including properties of time and space beyond the traditional initial point, offering a comprehensive analysis of universe nucleation and spacetime topology. Hope this work can contribute positively to scientific knowledge and benefit humanity [3].

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